



Current and future niche of North and Central American sand flies (Diptera: Psychodidae) in climate change scenarios

Author(s): Moo-Llanes D, Ibarra-Cerdeña CN, Rebollar-Téllez EA, Ibáñez-Bernal S, González C, Ramsey JM
Year: 2013
Journal: PLoS Neglected Tropical Diseases. 7 (9): e2421

Abstract:

Ecological niche models are useful tools to infer potential spatial and temporal distributions in vector species and to measure epidemiological risk for infectious diseases such as the Leishmaniasis. The ecological niche of 28 North and Central American sand fly species, including those with epidemiological relevance, can be used to analyze the vector's ecology and its association with transmission risk, and plan integrated regional vector surveillance and control programs. In this study, we model the environmental requirements of the principal North and Central American phlebotomine species and analyze three niche characteristics over future climate change scenarios: i) potential change in niche breadth, ii) direction and magnitude of niche centroid shifts, iii) shifts in elevation range. Niche identity between confirmed or incriminated *Leishmania* vector sand flies in Mexico, and human cases were analyzed. Niche models were constructed using sand fly occurrence datapoints from Canada, USA, Mexico, Guatemala and Belize. Nine non-correlated bioclimatic and four topographic data layers were used as niche components using GARP in OpenModeller. Both B2 and A2 climate change scenarios were used with two general circulation models for each scenario (CSIRO and HadCM3), for 2020, 2050 and 2080. There was an increase in niche breadth to 2080 in both scenarios for all species with the exception of *Lutzomyia vexator*. The principal direction of niche centroid displacement was to the northwest (64%), while the elevation range decreased greatest for tropical, and least for broad-range species. *Lutzomyia cruciata* is the only epidemiologically important species with high niche identity with that of *Leishmania* spp. in Mexico. Continued landscape modification in future climate change will provide an increased opportunity for the geographic expansion of NCA sand flies' ENM and human exposure to vectors of Leishmaniasis.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3777871>

Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change;

Climate Change and Human Health Literature Portal

surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience:

audience to whom the resource is directed

Policymaker

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes

Geographic Feature:

resource focuses on specific type of geography

Tropical

Geographic Location:

resource focuses on specific location

Non-United States, United States

Non-United States: Non-U.S. North America

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Fly-borne Disease

Fly-borne Disease: Leishmaniasis

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

Climate Change and Human Health Literature Portal

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content